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Parts list
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1. DESCRIPTION

The TA-1A is a transmitter when used in conjunction with a receiver. The TA-1A incorporates a beat frequency oscillator (BFO) which enables any receiver having a short-wave band to receive CW signals. Since the TA-1A utilizes the power from the receiver and also the tube for the transmitter, the power output will depend upon the receiver being used. The modulator is used with the TA-1A when voice transmission is desired. The modulator may be used only when the transmitting tube is of the 6.3 volt filament type.

The complete TA-1A consists of three units: the first contains the transmitter and BFO, the second contains the modulator for phone operation, and the third is a plastic bag containing the necessary accessories and crystals.

2. CHARACTERISTICS

2.1. Physical

2.1.1. Transmitter and BFO

Weight:

Size:

| | | | | | |
|------------|----|----------|---------|-----------|---------|
| DOC | 10 | REV DATE | 3-12-60 | BY | 006632 |
| ORIG COMP | | ORIG | | TYPE | |
| ORIG CLASS | U | PAGES | 13 | EXT CLASS | C |
| JUST | 22 | NEXT REV | 2010 | AUTH | NR 10-2 |

2.1.2. Modulator

Weight:

Size:

| | |
|--|-----------|
| ORIGINAL CL BY | 23 5979 |
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2.1.3. Accessory Bag

Weight: Approximately 1 pound

Contents: FT-243 type crystals

- 1 - Telex earset
- 1 - Power cable
- 1 - Modulator cable
- 2 - Tank coils
- 3 - #331 lamps (antenna lamp)
- 3 - #327 lamps (tuning indicator)
- 1 - Socket adapter (AD-1) or adapters as required.
- ~~1 - Tuning indicator~~
- 1 - Telex key jack

2.2. Electrical

2.2.1. Frequency Range

The frequency range is 3 to ¹⁷~~16~~ mc covered in two bands,
|| e.g., 3 to ^{7.5}~~8~~ mcs and ^{7.5}~~8~~ - ¹⁷~~16~~ mcs.

2.2.2. Crystals

Use fundamental crystals below 8 mcs. Third harmonic
|| operation should not be contemplated. Doubling should
be avoided when possible.

2.2.3. Power Output

The power output depends on the supply voltage, the antenna impedance, the output frequency, and the type of operation, e.g., phone or CW. With a supply voltage of 240 volts ("key-down") and using a 6V6 output

*add
↓
CW*

tube, the power output is approximately 4 watts;
the power will drop to approximately 3 watts in phone
position. When using an AC-DC type receiver, the //
power output will be approximately 1 watt in CW
position.

2.2.4. Antenna Impedance

Each
~~The~~ antenna loading coil contains 8 taps to adjust
for antenna impedances from 70 to 1200 ohms. ~~Five~~
~~of these taps are used for the high frequency band~~
~~and all taps are used for the low band.~~

2.2.5. Beat Frequency Oscillator

The BFO has a mean frequency of 455 kc and can be
varied ± 5 kc by adjusting the BFO control.

2.2.6. Power Requirements

|| When using voice operation the transmitting tube
must have a 6.3 volt filament. The modulator re-
quires this voltage for proper operation.

3. THEORY OF OPERATION

3.1. General

The audio output tube of a receiver is removed and used as the
transmitting tube in the TA-1A. The power required for the
transmitter and modulator is supplied *from the* by the cable which connects
the transmitter to the receiver. The audio signal at the receiver
is fed through the power cable to the telex phone jacks on the

transmitter. An antenna lead is fed through the power cable from the transmitter, through the send-receive switch, to the white lead projecting from the power cable plug. The black lead projecting from the power cable plug is the ground lead which is common to the TA-1A chassis and the external ground connection.

3.2. Transmitting (CW)

The transmitter is a single tube, crystal controlled, grid-plate oscillator. Resonance is indicated by the tuning adapter ^{indicator} which plugs into the external key jack. The tuning adapter is a neon bulb ^(which is) connected to the plate of a #327 pilot lamp which is of the high voltage, low current type the transmitting tube through a 3 μ f capacitor, (28.0V, 40 ma). Since the lamp is in series with the cathode ^{when the neon lamp glows} ~~in the~~ desired output circuit, Resonance is indicated ^{by tuning for minimum brilliancy} ~~by tuning for minimum brilliancy~~ frequency as marked on the tuning knob. When tuning for resonance, the antenna tap switch, located on top of the plug-in tank coil, should be placed in the tune (T) position to disconnect the antenna from the tank coil. ~~On the low band it is possible for the lamp to be completely extinguished at resonance.~~

The switch on the tank coil is used to provide a close impedance match to the antenna by tapping the antenna to the tank coil.

The antenna current is indicated by a #331 pilot lamp. [This lamp is normally shorted by a momentary push switch which is depressed while making tap switch selections to obtain maximum antenna current.] The lamp is of the low voltage, low current type (1.3V, 60 ma) and thus has little effect upon the loading of the transmitter.

The lamp is normally shunted by a thermistor which allows a wide range of current, from approximately 40 to over 200 milliamperes, to flow into the antenna without burning out the lamp. A switch is incorporated in the circuit to allow this thermistor to be removed when the antenna current is low so that an indication will be visible from the lamp. The switch should be left in the HI position unless it is impossible to obtain any current indication on the lamp. If it is impossible to obtain any antenna current indication in the HI or LO positions (this may occur when the plate voltage is low and the antenna impedance is high) the length of the antenna ~~should~~ should be increased (or shortened) 2 or 3 feet. This should lower the antenna impedance and allow an indication from the lamp. The brilliancy of the lamp is not necessarily an indication of power output, e.g., the power output may be high and the lamp brilliancy low, but maximum brilliancy should always be obtained during tuning.

3.3. Transmitting (Voice)

With the modulator connected to the transmitter and the phone/CW switch in phone position, the screen grid voltage is lowered by a resistor in parallel with the screen grid. Lowering the screen voltage provides better linearity on the positive modulation cycle and also increases the percentage of modulation. Since the average screen voltage has been lowered, the power output will decrease slightly in voice operation. The

modulator power is obtained by rectifying the 6.3 VAC filament voltage in a voltage doubling circuit. No attempt should be made to use the modulator when the transmitting tube is not of the 6.3 VAC type. The modulator should not be used with AC-DC type receivers. Common ground on one side of the filament supply is no problem since the ground for the modulator is isolated.

3.4. Receiving

The send-receive switch connects the antenna either to the transmitter or to the receiver via the power cable. If the receiver has a separate antenna for receiving, the switch may be left in the transmit position. The BFO is capacitively coupled to the receiver's antenna lead through a 6.8 uuf capacitor. When listening to a voice station, the BFO switch should be "off" to prevent a beat note from being heard. The BFO coil is slug-tuned and may be adjusted for IF frequencies from approximately 415 to 555 kcs. The three screws on the bottom of the transmitter must be removed to obtain access to the BFO coil. The BFO control ~~on the~~ will vary the tone ± 5 KC from the nominal value.

4. OPERATION

4.1. General

The tube socket adapter (AD-1) which plugs into the receiver's output tube socket (see Figure 3) is to be used with octal tubes that have pin connections as shown in the Appendix (page).

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Miniature
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Spare adapters are included which may be used when the output tube has different pin connections from those shown. These adapters (one for the transmitter's tube socket and one for the receiver's tube socket) should be wired and tested before the TA-1A is ³ ~~to be~~ used in a transmission. ~~Any~~ Errors in wiring may cause damage to the receiver and/or the transmitter. See Appendix for instructions to wire adapters.

Figure 3 illustrates the connections to be made between the receiver, the transmitter and the modulator. Because B+ voltages are present on the pins of the connecting cables, the plugs should always be connected at both ends to prevent accidental shock. [For CW operation, the modulator and modulator cable ^{are} ~~would be~~ removed.] It is not recommended that an AC-DC ~~type~~ receiver be used due to the AC voltage that may exist between the receiver chassis and ground, the transmitter chassis and ground, or between the receiver chassis and the transmitter chassis. If an AC-DC type receiver is used, NO external ground wire is used and the black ground lead extending from the power plug is NOT connected to the receiver. The modulator is not to be used when the receiver is of the AC-DC type; the modulator is used only when the filament supply is 6.3 VAC. C K

After connections have been made as shown in Figure 3, turn the receiver on and place the Send-Receive ^{BFO} switch to the receive position (R). The audio signal from the receiver may be heard through the telex earset. For CW reception, turn the ^{S-R} BFO switch ^{to BFO} on and adjust the BFO knob for the tone desired. For voice operation, turn the ^{S-R} BFO switch ^{to R} off.

4.2. Transmitting (CW)

The switches on the transmitter are placed in the following positions:

- (1) Phone-CW switch in CW position.
- (2) ~~Band switch in either LO (3 - 6 mc) position or HI position (8 - 16 mc).~~ ^{Place LO Band Coil (3 to 7.5 MC) or HI Band coil (7.5-17 MCs)}
^{in coil socket. Note: The HI Band coil has red markings on the antenna loading switch.}
- (3) Antenna ~~tap~~ ^{loading} switch in T position.
- (4) Send-Receive switch in S position.
- (5) Antenna current switch in HI position.
- (6) The BFO switch on.

The tuning control has two frequency scales, 3 - ^{7.5} mcs and ^{7.5} 8 - ¹⁷ ~~16~~ mcs. The red indicating arrow is used with the high band and the white arrow with the low band. ~~Insert the tuning adapter into the external key jack.~~ Adjust the tuning control to the desired output frequency to obtain ^{a "glow"} ~~minimum brilliancy~~ ^{high tuning indicator} from the ~~tuning adapter.~~ ~~It is possible for the lamp to be completely extinguished. Remove the tuning adapter from the external key jack.~~

Press the hand key and push the push-button switch with one hand. Rotate the tap switch (on top of the coil) to the position that gives maximum brilliancy from the antenna indicator lamp. *Ntc: The neon lamp may fail to glow when* ~~NOTE: All tap positions (1 through 8) are used the antenna is properly loaded.~~ ~~on the LO band (3 - 8 mcs) and tap positions 4 through 8 are used for the HI band (8 - 16 mcs).~~ If ^{NO} ~~the~~ antenna current is visible, change the antenna current switch to the LO position. With the antenna current switch in the LO position it is possible to burn out the lamp. If the lamp begins to glow brightly, change the antenna current switch to the HI position. After maximum brilliancy has been obtained by adjusting the tap switch, readjust the tuning control to obtain maximum lamp brilliancy. Release the push button switch and the lamp will be extinguished. A message may now be sent by using the hand key or plugging in an external key into the external key jack. The transmitter may be checked at any time by keying the transmitter and depressing the push button to obtain an indication from the antenna current indicator. ~~After the operator has become familiar with the adjustments, it is possible to eliminate the tuning adapter from the tuning procedure.~~

4.3. Transmitting (Voice)

The same tuning procedure is followed for voice transmissions as is outlined above for CW operation. After the transmitter has been tuned, the modulator is connected to the transmitter and the phone-CW switch is placed in phone position. The

hand key is then depressed during the voice transmission.

Modulation may be checked by pressing the push button, and noticing the change in lamp brilliancy *while speaking into the microphone.*

5. MAINTENANCE

5.1. Transmitter

The transmitter ~~may be repaired by making voltage and resistance measurements.~~ Total cathode current of the transmitting tube may be measured by inserting a 0-100 milliamperere DC meter into the external key jack.

5.2. Beat Frequency Oscillator

The voltage across the zener diode should be 7.0 volts \pm 1.0 volt DC. If this voltage is high, the zener diode should be replaced. If the voltage is low, the zener diode or the transistor may be defective. Emitter current is approximately 1.0 milliamperere. The zener diode current is approximately 3.0 milliamperes when the DC supply voltage is 250 VDC. RF output voltage measured on the white lead that connects ^{TO} the receiver's antenna connection should be approximately 0.5 volts peak-to-peak.

5.3. Modulator

The total DC current of the modulator is approximately 60.0 milliamperes. Collector current is approximately 0.65 milliamperes for the amplifier stage and 5.4 milliamperes for the driver stage. The idle current of the class B stage is approximately 2.0 ma and will rise to approximately 25 milliamperes with

sine wave modulation. The voltage across the zener diode should be 12.0 volts \pm 1.0 volt.

The modulator may be checked by placing a 50,000 ohm, 1 watt resistor between pins D and F and applying 6.3 VAC between pins A and B of the Continental plug. The output waveform may then be viewed with an oscilloscope across the 50,000 ohm resistor. The voltage waveform should be at least 100 volts peak-to-peak.

5.4. Transmit Key

The travel and spacing of the key may be adjusted using an Allen wrench and a small screwdriver. These adjustments are located just above the knob and are accessible from the top of the transmitter.

APPENDIX

Instructions are herein given for wiring adapters for use with tubes that do not have pin connections as shown for use with socket adapter AD-1.

Any tube that does not have pin connections for use with the socket adapter (AD-1) will require two adapters, one for the receiver and one for the transmitter.

The 7 pin molded plug on the power cable connects to the receiver and the pins must be connected to the following:

| <u>Molded Pin No.</u> | <u>Connection in Receiver</u> |
|-----------------------|--|
| 1 | No connection |
| 2 | Ground - Cathode of output tube |
| 3 | Filament - Filament of output tube |
| 4 | " " " " " |
| 5 | B+ - Plate of output tube |
| 6 | B+ - Grid No. 2 (Screen grid) of output tube |
| 7 | Audio - Grid No. 1 (Control Grid) " " |

The octal socket on the transmitter must be connected to the transmitting tube in the following manner:

| <u>Octal Socket Pin No.</u> | <u>Transmitting Tube</u> |
|-----------------------------|--|
| 1 | Internal Shield |
| 2 | Filament |
| 3 | Plate |
| 4 | Grid No. 2 (Screen Grid) |
| 5 | Grid No. 1 (Control Grid) |
| 6 | No connection |
| 7 | Filament |
| 8 | Cathode and Grid No. 3 (Suppressor Grid) |

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